Impact of Liquidity constraint on Firms' Investment Decisions

Saibal Ghosh and Saurabh Ghosh

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Saibal Ghosh and Saurabh Ghosh[1]

[1]Department of Economic Analysis and Policy, Reserve Bank of India, Central Office Building, Fort, Mumbai 400001. INDIA mail: saibalghosh@rbi.org.in and Monetary Policy Department, Reserve Bank of India, Central Office Building, Fort, Mumbai 400001. INDIA mail: saurabhghosh@rbi.org.in. The views expressed are strictly the author's personal opinion.

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Abstract

The paper investigates whether the effects of monetary policy on firm investment can be transmitted through leverage. The findings indicate that monetary contractions reduce investment for highly leveraged firms. The estimates imply that a 1percentage point increase in leverage reduces investment by 0.109 percent through leverage. Robustness tests broadly validate these findings.

I. Introduction

It has been argued that changes in monetary policy have large impact on real economic variables (Bernanke and Blinder, 1992). The channels through which these effects are transmitted are, however, still a matter of debate. Several channels of transmission have been proposed in the literature. Salient among these include the money channel and the bank lending channel. The former channel argues that a reduction in bank reserves lowers the stock of money, which leads interest rates to rise. Investment and aggregate demand, as a result declines consequent upon the higher cost of capital. The bank lending channel, on the other hand, contends that by lowering reserves, a monetary contraction drains deposits from the banking system and hence, reduces the supply of loans and aggregate spending (Kashyap *et al*., 1993).

Empirical evidence as the existence of these channels is, at best, mixed. In view of this, several studies have started to explore the possible role played by capital market imperfections in transmitting and amplifying monetary policy shocks and a literature on the broad credit channel has emerged (Hubbard, 1995; Bernanke *et al*., 1996). According to this view, because of informational asymmetries, lenders are not well informed about the quality of the firm and demand a premium on the debt or stock issued by the firm. As the premium on external finance is inversely related to the borrowers' financial conditions, such as net worth, an adverse monetary shock which causes the borrower's financial condition to deteriorate will engender an increase in its cost of external finance and a decrease in its borrowing abilities. Consequently, the borrower's investment and output will fall.

The paper employs a sample of Indian manufacturing firms for the period 1995-2004 to test whether the effects of the change in monetary policy on firm investment can be transmitted through leverage. This idea can be traced back to Fisher (1933) in explaining the Depression of the 1930s. According to the Fisherian hypothesis, an unanticipated fall in the price level leads to a decline in borrowers' net worth and an increase in their real debt burdens, which results in a decrease in borrowing and investment.

More recent work on capital market imperfections has shed further light on the role of debt in transmitting monetary shocks. More specifically, because of conflicts of interests and informational asymmetries between lenders and borrowers, debt induces agency problems, which in turn lead to a premium on external funds. Since a highly indebted borrower is more likely to default and has a greater incentive to opt for excessively risky projects, the premium on external finance will be higher for firms with lower net worth or higher leverage. Bernanke and Gertler (1989) show that exogenous shocks, such as decline in production, will lower a firm's cash flow and boost effective cost of investment. The fall in investment spending will lower the firm's output and cash flow in subsequent periods, leading to the propagation of the initial shock through credit cycles (Kiyotaki and Moore, 1998).

While there is by now a rapidly expanding literature on the presence of finance constraints on investment decisions of firms for developed countries, limited empirical research has been forthcoming in the context of developing countries for two main reasons. First, until recently, the corporate sector in emerging markets encountered several constraints in accessing equity and debt markets. As a consequence, any research on the interface between capital structure of firms and finance constraint could have been largely constraint-driven and hence, less illuminating. Second, several emerging economies, even until the late 1980s, suffered from 'financial repression', with negative real rates of interest as well as high levels of statutory pre-emption. This could have meant restricted play of market forces for resource allocation.

Issues regarding the interaction between financing constraint and corporate finance have, however, gained prominence in recent years, especially in the context of the fast changing institutional framework in these countries. Several emerging economies have

introduced market-oriented reforms in the financial sector. More importantly, the institutional set-up within which corporate houses operated in the regulated era has undergone substantial transformation since the 1990s. The move towards market-driven allocation of resources, coupled with the widening and deepening of financial markets, have provided greater scope for corporate houses to determine their capital structure.

The rest of the paper unfolds as follows. Section II discusses the institutional context to contextualize the present study. Section III explains the methodology and the data employed in the paper. Section IV presents the results and discusses robustness check followed by the concluding remarks in the final section.

II. The Institutional Context

The introduction of the concept of a socialist economy in the 1960s with its concomitant focus on poverty reduction, egalitarianism and social equality meant that the Indian government followed highly restrictive policies with respect to trade, industry and finance. The process of transition towards self-reliance (read 'import substitution'), driven to an overarching extent by concerns of 'export pessimism' amongst developing nations nested on the logic of heavy-industry oriented industrialization within a closed economy framework. Such a policy engendered the need for industrial licensing whereby firms would have to apply for a license for setting up new units or for capacity expansion. This was coupled with a controlled regime of import restrictions that governed the utilization of scarce resources. The protection provided to domestic industry by the import licensing was buttressed by extremely high tariff levels across the board, thereby negating the free play of market forces in investment decisions. Furthermore, the licensing regime led to several adverse consequences, in the form of barriers to entry in several industries and more importantly, led to rent-seeking behavior by business houses by strategically pre-empting competition.

Not surprisingly therefore, until 1991, the corporate sector faced several constraints on its choices regarding sources of funds. Access to the equity market was controlled by a regulatory body, the Controller of Capital Issues (CCI), an agency under the Government, which imposed restrictions on corporates intending to raise funds through the equity route. Long-term debt was largely under the purview of state-owned development banks, which,

either through direct lending or through refinancing arrangements, virtually monopolised the supply of debt finance to the corporate sector.

In the financial sector likewise, till the initiation of reforms in 1992, financial institutions faced heavy restrictions on application of funds. In July 1991, for instance, commercial banks had to hold in cash reserves and Government debt instruments, as much as 63.5 per cent of increases in deposits. In addition, they had to extend 40 per cent of their credit to priority sectors such as agriculture, small-scale industries and housing with sub-targets for each at subsidized rates differentiated by purpose, size of loan and borrower. Even the free portion of banks' resources was subject to 'credit norms', which set inflexible limits to loans according to sector, purpose and security. The Government also regulated the use of financial instruments as well as interest rates on loans and deposits; lending rates were fixed for both priority and non-priority sectors.

In 1992, as part of the sweeping set of reforms relating to the equity market, the CCI was abolished and corporate houses were provided the freedom to access capital markets and price their securities, subject to prudential regulations of the Securities and Exchange Board of India (SEBI), the regulator of stock markets. Furthermore, Indian firms in sound financial condition were allowed to issue equity and convertible bonds abroad. Likewise, as regards raising resources domestically through debt capital, institutional reforms have been aimed at curtailing the monopoly in supply of long-term funds by development banks, with banks being also permitted to enter long-term financing.

In the financial sector, the administered interest rate structure of banks was progressively rationalised since the 1990s. The prescriptions of rates on all term deposits, including conditions of premature withdrawal and offering uniform rate, irrespective of the size of deposits, was dispensed with. Likewise, lending rates were also deregulated. The Bank Rate (the rate at which the central bank refinances commercial banks), after being dormant for several decades, was activated as a signalling rate in 1997 and simultaneously, the statutory pre-emption on bank deposits were gradually lowered, providing banks with greater freedom in credit allocation. The removal of these twin restrictions meant a greater role of the price mechanism (interest rate) in the resource allocation process and allowing

corporates to freely raise resources from domestic capital markets, enabling a greater role of the market forces in company affairs.

Notwithstanding these developments, it is widely perceived that the constraints on finance have tended to persist, with the result that investment by corporates has not been forthcoming to the desired extent. Evidence indicates that, over the sample period, gross fixed capital formation by the corporate sector has declined from an average of 7.8% for the first five years to less than 6% over the period 2000-04. Observers have therefore argued that the institutional context, in general and the export orientation of firms in particular might be an important factor towards exploring the relevance of finance constraints (Ganesh Kumar *et al.*, 2001). An important aspect not adequately accounted for in earlier studies has been whether and as to how firm leverage impacts finance constraints and this becomes a major concern of the paper.

III. Methodology and Data

Under the assumptions of perfect competition, constant returns and capital as the only quasi-fixed factor, the marginal Q of a firm (a sufficient statistic of a firm's investment opportunities), can be approximated by the average Q (Hayashi, 1982). The reduced equation for investment is given by:

$$I_{it} / K_{it} = \alpha_i + \beta Q_{it} + \lambda_t + u_{it} \qquad (1)$$

where (suppressing subscripts) I is capital expenditure, K is the capital stock, Q denotes average Q and is defined as the ratio of market value of capital to its replacement cost, α accounts for unobserved firm-specific effects, which is assumed to be constant over time, λ captures the cyclical factors that have common effects on all firms and u is the stochastic error term.

Numerous studies have found that cash flow and other financial variables have explanatory power for investment in equation (1) and that the sensitivity of investment to cash flows varies with the firm's age, size, dividend policy and other variables characterizing its financial condition (Fazzari *et al.*, 1988). This suggests that, given capital market imperfections, high premium on debt and equity cause external and internal funds to be imperfectly substitutable. We test whether changes in monetary policy can affect investment

through leverage by including leverage and the interaction of leverage with an indicator of monetary tightness together with the other controlling variables in equation (1) and by examining the coefficient on the interaction term.

Accordingly, the baseline equation to be estimated is given by specification (2)

$$I_{it} / K_{it-1} = \alpha + \beta_1 (CF / K)_{it-1} + \beta_2 (S / K)_{it-1} + \beta_3 LEV_{it-1} + \beta_4 LEV_{it-1} * MYP_{t-1} + YD_t + ID_t + u_{it} \quad (2)$$

where among the regressors, we have included the beginning of period ratios of cash flows to capital stock (CF/K) and sales to capital stock (S/K), beginning of period market leverage (LEV) and an interaction term between LEV and an indicator of monetary policy tightness (MYP). The lagged value of the firms' financial variables has been employed since several studies have uncovered lagged effects of monetary policy on firms' activities (Romer and Romer, 1989). Using lagged values also enables to minimize the endogeneity problem.[2] Year dummies (YD) are included in all models to control for common trends or business cycle effects. Finally, industry dummies (ID) are included to control for industry-specific features not explicitly factored into the analysis. Summary statistics of the variables along with their definitions is set out in Table 1.

Table 1: Summary Statistics of Sample Variables

Variable	Definition	Mean	Median	Minimum	Maximum
(I/K)	$[K_{t+1}+Depreciation_t-K_t(1+\pi_t)]$/[Plant property equipment at end of t-1 minus capital expenses during period t-1 plus accumulated depreciation and amortization until the end of period t-1 (K_t)]	0.632	0.103	-55.54	1073.80
Q	Market value of equity/Book value of debt	36.278	0.550	0	11.988
(CF/K)	(net profit+depreciation)/K	33.587	0.091	-12.79	85.164
(S/K)	Sales/K	13.762	1.198	-7.815	85.26
LEVERAGE1	Total borrowing/Total asset	0.411	0.814	0	11.755
LEVERAGE2	Total borrowing/Total equity	7.056	5.041	0	47.610

Three aspects need to be discussed before proceeding with the empirical analysis. The first is the measurement of leverage. In line with the literature (Davis and Stone; 2004, Ghosh and Sensarma, 2004;), we employ two measures of leverage: total borrowing to total assets (LEVERAGE1) and secondly, the widely employed measure of leverage (LEVERAGE2): the debt-equity ratio (Davis and Stone, 2004).

[2] If the contemporaneous value of cash flows, sales and leverage are used, the estimates on the coefficients of the equation will be biased because these variables are endogenous.

The second is the measure of monetary policy stance. Several measures of the stance of monetary policy have been proposed. Since there is no consensus as to which is superior, we employ two alternate indicators that have been widely employed in the Indian context. The first one is the Bank Rate, which is the medium-term signaling rate of the monetary authorities. The disadvantage of this variable is that it was essentially static over a large span of the sample period, and therefore might be inadequately equipped to capture the stance of monetary policy. An alternative indicator is the primary cut-off yield on 364-day treasury bills. Using the yield on T-bills as a monetary policy stance variable has gained prominence of late, both internationally (Calvo and Reinhart, 2002) as well as in the Indian context (Prasad and Ghosh, 2005).

Third, and following from the second, we construct our (continuous) indicator of monetary policy tightness by taking the difference between the yield on a representative 10-year T-bill and the short-term rate (as captured by the Bank Rate or the 364-day T-bill yield). Accordingly, we compute four measures of monetary policy tightness.[3]

The source of the data is the publicly available *Prowess* database (Release 2.4), generated and maintained by the Centre for Monitoring the Indian Economy (CMIE), a leading private think-tank in India. This database is broadly similar to the *Compustat* database of US firms and is increasingly employed in the literature for firm-level analysis on Indian industry for analysis of issues like the performance of firms affiliated to diversified business groups (Khanna and Palepu, 2000), the interlinkage between monetary policy and corporate governance (Ghosh and Sensarma, 2004) and the association between banks' non-performing loans and corporate leverage (Ghosh, 2005). The dataset contains financial information on around 8,000 companies, including around 4500 services companies, which are either listed on the stock exchanges as well as major unlisted public companies having sales in excess of Rs.10 million (US $1≈Rs.44). In addition, if an entity is not listed, it qualifies for inclusion in the database if the average sum of sales and total assets is at least Rs.200

[3] These four measures are
MYP1=LEVERAGE1*SPREAD1
MYP2=LEVERAGE2*SPREAD1
MYP3=LEVERAGE1*SPREAD2 and
MYP4=LEVERAGE2*SPREAD2
where SPREAD1=10 year T-bill yield *less* 364 day T-bill yield
and SPREAD2=10 year T-bill yield *less* Bank Rate

million as per the latest audited financial results. There is detailed information on their financial performance, balance sheets details and stock price data. The database also contains background information, including equity holding pattern, plant location and new investment projects for these companies.

The selection of the sample firms proceeds in three steps. In step one, we select all firms that are listed on the National Stock Exchange[4]. This yields a total of 1538 companies for 1995-2004. In step two, given the focus on the choice of debt by manufacturing firms, we only retain firms whose main activity is in manufacturing, but exclude those for which their main activity is in the service sector, including finance. This classification left us with of 1210 manufacturing firms. In the final step, we delete firms for which data on the relevant dependent variables were not reported for all least five consecutive years of the sample. Following from this criterion, we were finally left with 1118 manufacturing firms. The composition of the sample is presented in Table 2. It can be observed from the table that around 40 per cent of the firms belong to chemicals, machinery and textile, indicating that given the classification adopted for incorporation of firms in the database, a significant proportion belong to these three sectors.

Table 2: Distribution of Sample Firms by Industry Classification

Industry	Number of Firms	Percent to Total Sample
Heavy	39	3.4
Drugs and Pharmaceuticals	75	6.6
Chemicals	178	15.6
Cement	36	3.2
Textile and textile products	143	12.5
Auto Ancillaries	84	7.4
Food, Sugar and Beverages	97	8.5
Electrical Machinery	133	11.7
Diversified	36	3.2
Others	319	28.0
Total	1140	100.0

Source: Compiled from *Prowess* database

III. Estimation and Results

The results of the estimation procedure are reported in table 3. For the whole sample, the estimates on the coefficients on leverage are positive and significant at the 1 percent level; the interaction terms with SPREAD1 as the measure of monetary policy tightness is

[4]The National Stock Exchange (NSE) is the state-of-the-art exchange for listed Indian companies. The NSE commenced operations in 1994, but became fully operational effective 1995.

negative and significant. This suggests that while an increase in leverage raises investment, the rise is dampened if a monetary contraction follows. More specifically, the estimates imply that a 1 percentage point increase in leverage lowers investment by 0.39 percent (0.478*0.814) through leverage for a firm with a median leverage in the sample. Across all equations, sales have positive effects on investment. The adjusted R^2 indicates that the specification with spread 1 as dependent variable explains between 25-34 percent of the variation in investment. When debt equity ratio (DER) is considered as the alternate measure of investment, neither the ratio nor its interaction with monetary policy tightness indicator are significant at conventional levels, suggesting that DER does not perform well as a measure of leverage in the Indian context.

We consider several robustness tests of the baseline model. First, we consider whether larger firms are more affected by a contractionary monetary policy *vis-à-vis* smaller firms. Accordingly, we construct a dummy for size, which equals one if the size of the firm, defined in terms of logarithm of the firm's total assets, is greater than the median firm size in the sample. This dummy is interacted with the monetary policy tightness indicator defined by SPREAD 1 (see footnote 3). The results, presented in table 4, shows that this coefficient and significant at conventional levels. Specifically, vis-à-vis small firms, the contractionary effects of monetary policy on larger firms, transmitted through leverage, is significant.

Table 3: Estimates of Investment Equation – Overall Sample

Variable	Model 1	Model 2	Model 3	Model 4
Intercept	0.195 (0.922)	0.181 (0.919)	0.197 (0.902)	0.197 (0.902)
Lag (CF/K)	-0.021 (0.291)	-0.034 (0.291)	-0.253 (0.288)	-0.254 (0.288)
Lag (S/K)	0.005 (0.001)*	0.005 (0.001)*	0.009 (0.002)*	0.009 (0.001)*
Total debt/Total asset	0.910 (0.489)***	0.907 (0.432)***		
Total debt/Total equity			-0.009 (0.018)	-0.009 (0.018)
MYP1	-0.478 (0.289)***			
MYP2			-0.0001 (0.001)	
MYP3		-0.412 (0.205)**		
MYP4				-0.0006 (0.006)
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
Diagnostics				
Number of observations	7187	7187	7179	7179
Time period	1995-2004	1995-2004	1995-2004	1995-2004
Adjusted R-square	0.034	0.025	0.006	0.007

Standard errors in parentheses

*, ** and *** indicates significance at the 1, 5 and 10% level, respectively

The second aspect we consider is whether younger firms are more affected by a contractionary monetary policy *vis-à-vis* older firms. Accordingly, we construct a dummy for age, which equals one if the age of the firm exceeds the median age of firms in the sample and interact this dummy with SPREAD 1. The results indicate that the magnitude on this coefficient is negative and highly significant at conventional levels, suggesting that younger firms encounter a more contractionary response to monetary policy *vis-à-vis* older firms. The other coefficients are materially unaltered in sign and magnitude.

The second aspect of interest is the response of highly leveraged firms as compared with low-leveraged firms. Intuitively, it is to be expected that firms with Q greater than one will respond differently than those will values of Q below it. This is because lower Q would imply fewer investment opportunities and lower expected net worth, which may aggravate the agency problems of debt. Accordingly, a contractionary monetary policy is likely to have stronger effects on investment for firms with Q less than unity.

The results reported in Table 4 show that while the estimates on the interaction terms are both negative, only the one for the sample in which Q<1 is actually significant. This supports our assertion that firms with limited investment opportunities are likely to encounter a stronger contractionary effect of monetary policy. Such firms are also likely to encounter a dampening influence on their cash flows as evidenced from the negative and statistically significant sign on this variable.

Table 4: Robustness Tests: Size, Age and Outward Orientation

Variables	Model 5	Model 6	Model 7	Model 8
	Size	Age	Export/Sales	Liquidity
Intercept	0.747 (0.963)	0.767 (0.951)	-0.047 (0.931)	0.473 (0.942)
Lag (CF/K)	-0.044 (0.291)	-0.082 (0.292)	-0.027 (0.291)	-0.017 (0.291)
Lag (S/K)	0.004 (0.001)*	0.005 (0.001)*	0.005 (0.001)*	0.004 (0.001)*
Total debt/Total asset	0.879 (0.689)	0.882 (0.689)	0.842 (0.690)	0.947 (0.691)
MYP1	-0.486 (0.288)***	-0.522 (0.289)***	-0.476 (0.288)***	-0.491 (0.289)***
Control*Spread 1	-0.222 (0.112)**	-0.274 (0.113)*	0.209 (0.117)***	-0.160 (0.092)***
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
Diagnostics				
Number of observations	7187	7187	7187	7187
Time period	1995-2004	1995-2004	1995-2004	1995-2004
Adjusted R-square	0.005	0.006	0.005	0.007

Standard errors in parentheses

*indicates significance at the 1% level

V. Conclusions

Recent theoretical work on capital market imperfections suggests that, because of conflicts of interests and information asymmetry between lenders and borrowers, debt introduces agency problems which in turn induce a premium for firms seeking external finance. Adverse monetary policy shocks increases firms' cost of investment by reducing their net worth and aggravating real debt burdens. Using alternate indicators of monetary policy tightness, the results provide support to the fact that a monetary contraction lowers investment, particularly for highly leveraged firms. A disaggregated response of firms according to size and leverage also supports the fact that the smallest firms with limited access to alternate finance are hardest hit by a monetary contraction; the lowly leveraged firms, in fact, increase their investment in response to a monetary contraction.

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